The physical characteristics of Cu~ 2S/CdS thin-film solar cell

Abstract

In recent years, efforts on the development of thin film solar cells have been more and more concentrated on Cu2S/CdS cells with a pn heterojunction. During the past decades, thin film photovoltaic cell of Cu2S/CdS was the most promising solar energy conversion (optoelectronic) device due to the high conversion efficiency more than 9.1%, easy fabrication and low cost [1]. However, it has generally been considered that the formation of p-type CdS is very difficult, because of the strong selfcompensation effect due to sulphur vacancies [2] and the depth of the acceptor level in CdS (~ 1 eV)[3], despite the fact that there have been some reports on p-type CdS [4]. Cadmium sulphide/copper sulphide solar cells are clearly heterojunction cell with CdS having energy gap of 2.42 eV and Cu2S having an energy gap of 1.2 eV. Considering the nature of sunlight, it is clear that the Cu2S layer is responsible for the bulk of photocurrent generation [5]. The interested method of fabrication of Cu2S/CdS solar cells is to vacuum evaporated CdS followed by wet dipping to form Cu2S [6, 7]. Several techniques such as dry process [8], vacuum evaporation [9], sputtering [10] and spray pyrolysis [11] have been applied for the production of Cu2S films.